

Chapter 5

Aircraft Recovery Methods and Applications

This chapter covers rigging methods, configurations, and the required recovery kit(s) for specified US Army rotary-wing and fixed-wing aircraft. The methods and applications in this chapter were verified as effective. However, the extent of damage to the disabled aircraft may require modified procedures. In all cases, the recovery helicopter should hold the disabled aircraft at a hover before transition into flight. This ensures that a proper balance is maintained and the disabled aircraft assumes a 0- to 10-degree, nose-low attitude.

When ground recovering an aircraft, the rotor head suspension method (if authorized) is the simplest means of loading the aircraft onto the recovery vehicle. Aircraft damage, configuration, or limitations may preclude use of either of these methods: the rotor head suspension; hard point attachment sling; attitude-controlled rotor head suspension; or the attitude-controlled, tandem hook, rotor head suspension. If so, load the aircraft using the bellyband method. Install lifting devices (straps, bellybands, etc.) as directed for the particular aircraft. This minimizes further damage to the aircraft. Modification of some procedures may be required to accommodate boom extension of the lifting equipment. This means positioning lifting eye closer to the aircraft.

AERIAL RECOVERY

RECOVERY METHODS

(See table 5-1 for specific instructions for each aircraft.)

OH-58A/C

5-1. The recovery methods for OH-58A/C aircraft are—

- Bellyband suspension – Approved.
- Rotor head suspension – Approved.
- Hard point attachment sling – Not applicable to this airframe.

OH-58D

5-2. The recovery methods for OH-58D aircraft are—

- Bellyband suspension – Approved.
- Rotor head suspension – Approved.
- Hard point attachment sling – Not applicable to this airframe.

UH-1H/V/N AND EH-1H

5-3. The recovery methods for UH-1H/V/N and EH-1H aircraft are—

- Bellyband suspension – Approved.
- Rotor head suspension – Approved.
- Hard point attachment sling – Not applicable to this airframe.

UH-60A/L, EH-60L AND MH-60G/K

5-4. The recovery methods for UH-60A/L, EH-60-L, and MH-60G/K aircraft are—

- Bellyband suspension – Approved.
- Rotor head suspension – Approved.
- Hard point attachment sling – Approved.

AH-1E/F/P/S

5-5. The recovery methods for AH-1E/F/P/S aircraft are—

- Bellyband suspension – Approved.
- Rotor head suspension – Approved.
- Hard point attachment sling – Not applicable to this airframe.

AH-64A AND AH-64 LONGBOW

5-6. The recovery methods for AH-64A and AH-64 LONGBOW aircraft are—

- Bellyband suspension – Approved.
- Hard point attachment – Not applicable to this airframe.
- Attitude-controlled, rotor head suspension – Approved.
- Attitude-controlled, tandem hook, rotor head suspension – Approved.

RAH-66

5-7. Procedures for rigging a disabled RAH-66 helicopter for recovery will be published at a later date.

CH-47D AND MH-47E

5-8. The recovery methods for CH-47D and MH-47E aircraft are—

- Rotor head suspension – Approved.
- Bellyband suspension – Approved.

C-12 AND RC-12

5-9. The recovery method for C-12 and RC-112 aircraft is—

- Bellyband suspension – Approved

C-23 SHERPA

5-10. The recovery methods for C-23 Sherpa aircraft are—

- Bellyband suspension – Approved.
- Hard point attachment sling – Approved.

UC-35 CESSNA CITATION

5-11. The recovery methods for UC-35 Cessna Citation aircraft are—

- Bellyband suspension – Approved.
- Hard point attachment sling – Approved.

Table 5-1. Methods and Application Table

AIRFRAME	RECOVERY EQUIPMENT					RECOVERY METHODS				
	ARK See Notes: 32, 34	I-UMARK See Notes: 32, 34	UMARK See Notes: 32, 34	HERK See Notes: 32, 34	OTHER	Rotor Head Suspension	Bellyband Suspension	Hard Point Attachmet Sling	Attitude- Controlled Rotor Head	Attitude- Controlled, Tandem Hook, Rotor Head Suspension
TYPE										
AH-1E/F/P/S	Yes See Notes: 2, 8	Yes See Notes: 2, 9, 16, 29, 35, 36	Yes See Notes: 2, 11, 16	No	No See Notes: 18, 21, 22, 23, 28, 31	Yes See Notes: 2, 15	Yes See Notes: 2, 17	No	No	No
AH-64A/ AH-64 LONGBOW	Yes See Notes: 3, 8	Yes See Notes: 3, 9, 16, 27, 30	Yes See Notes: 3, 11, 16, 27, 30	No	No See Notes: 18, 23, 28, 31, 33	Yes See Notes: 3, 15	Yes See Notes: 3, 17	No	Yes See Notes: 3	Yes See Notes: 3
C-12 RC-12	Yes See Notes: 8	No	No	No	Yes See Notes: 18, 23	No	Yes See Notes: 17	Yes See Notes: 17	No	No
C-23	Yes, See Notes: 8	No	No	No	Yes See Notes: 14, 18, 23, 28	No	Yes See Notes: 17	Yes See Notes: 17	No	No
CH-47D MH-47E	Yes See Notes: 5, 8	No	Yes See Notes: 5, 16	No	No See Notes: 18, 23, 28, 31, 33	Yes See Notes: 5, 15	Yes See Notes: 5, 17	No	No	No
EH-1H/ UH-1H/V/N	Yes See Notes: 6, 8	Yes See Notes: 6, 9, 16, 35, 36	Yes See Notes: 6, 16	No	No See Notes: 18, 21, 23, 28, 31	Yes See Notes: 6, 15	Yes See Notes: 6, 17	No	No	No
EH-60L/ MH-60G/K/ UH-60A/L	Yes See Notes: 4, 8, 19	Yes See Notes: 4, 9, 16, 26, 27	Yes See Notes: 4, 16, 27	Yes See Notes: 4, 10, 12, 16	No See Notes: 18, 20, 23, 28, 31, 33	Yes See Notes: 15	Yes See Notes: 4, 17	No	No	No
OH-58A/C	Yes See Notes: 1, 8	Yes See Notes: 1, 9, 16, 35, 36	Yes See Notes: 11, 16	No	No See Notes: 18, 21, 23, 28, 31	Yes See Notes: 1, 15	Yes See Notes: 1, 17	No	No	No
OH-58D	Yes See Notes: 7, 8	Yes See Notes: 7, 9, 16, 25	Yes See Notes: 7, 11	No	No See Notes: 18, 21, 23, 28, 31	Yes See Notes: 7, 15	Yes See Notes: 7, 17	No	No	No
RAH-66	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24	TBD See Notes: 24
UC-35	Yes See Notes: 8	No	No	No	Yes See Notes: 13, 18, 23, 33	No	Yes See Notes: 17	No	No	No

NOTES

¹Refer to TM 55-1520-228-23 series and recovery kit operating manuals for specific aerial/ground recovery rigging procedures.

²Refer to TM 55-1520-234-23 series and recovery kit operating manuals for specific aerial/ground recovery rigging procedures.

³Refer to TM 55-1520-238-S for specific aerial/ground recovery rigging procedures.

⁴Refer to TM 1-1520-237-S for specific aerial/ground recovery rigging procedures.

⁵Refer to TM 55-1520-241-S for specific aerial/ground recovery rigging procedures.

⁶Refer to TM 55-1520-242-S for specific aerial/ground recovery rigging procedures.

⁷Refer to TM 55-1520-248-S for specific aerial/ground recovery rigging procedures.

⁸Refer to TM 55-1670-251-20&P, *Organizational Maintenance Manual (Including Repair Parts and Special Tools List) for Aerial Recovery Kit (ARK)*, 6 June 1975, with C4, dated 12 July 1989.

⁹Refer to TM, I-UMARK, *Interim Unit Maintenance Aerial Recovery Kit Operating Procedures*, Revision B, 30 January 1991.

¹⁰Refer to I-UMARK TM, for HERK, *Helicopter Recovery Kit Operating Procedures*.

¹¹Refer to TM, *Unit Maintenance Aerial Recovery (UMARK)*, Kaman Aerospace Corporation, 22 June 1995, revised 30 April 1996, for specific aerial/ground recovery rigging procedures.

¹²Refer to TB 1-1520-237-20-157, *Hoisting and Aerial Recovery of UH-60/EH-60 ESSS Fixed Provisioned Helicopters*, for specific aerial/ground recovery rigging procedures.

¹³Refer to Chapter 7, *Lifting and Shoring*, Cessna Aircraft Company, Model 560, Maintenance Manual, for specific aerial/ground recovery rigging procedures.

¹⁴Refer to C-23 Sherpa, Maintenance Manual, for specific aerial/ground recovery rigging procedures.

¹⁵When ground recovering an aircraft, the rotor head suspension method is the simplest means of loading the aircraft onto the recovery vehicle or to aerial recover to a designated area. If aircraft damage, configuration or limitations preclude use of the rotor head suspension method, then the aircraft is loaded using the belly band method.

¹⁶The I-UMARK, UMARK, and HERK are intended primarily to recover aircraft that have made a forced landing; are upright; and have no obvious damage to the rotor head, transmission, transmission mounts, or serious structural damage to tailboom assembly. If damage of this nature has occurred, aircraft will be recovered with the Aerial Recovery Kit (ARK).

¹⁷Fuselage damage may occur if the belly band method is used.

¹⁸After completion of the recovery, ensure that aircraft is firmly on the ground.

¹⁹On aircraft having the External Stores Support System (ESSS) installed, removal of the ESSS will be required to facilitate installation of the slings.

²⁰If hard points are damaged beyond their ability to support the weight of the helicopter, then the bellyband suspension can be used instead of the hard point method.

²¹Failure to place the collective in the full down position will result in damage to the blades.

²²When the main rotor system is being tied down, the web strap on the forward and aft blades must be crossed then tied down. All tie-down points are the same as those on the B540 main rotor system. If the blades are tied down so tight that there is a coning of them, damage will occur to them. The K747 rotor blades must remain straight and level.

²³Make certain that the cowlings, panels, and doors are secure before hookup.

²⁴Method and configuration for rigging a disabled RAH-66 Comanche helicopter for recovery will be published at a later date.

²⁵US Army flight tests have shown that the OH-58D aircraft may be recovered with the I-UMARK. In this configuration, the aircraft is lifted by the rotor hub with slings and spreader bar, which provides a load path around the mast turret assembly (MTA). The helicopter is flown with the main rotor blades attached and tied down during the aerial recovery. Except in emergency conditions, the mast mounted sight on the OH-58D requires removal.

²⁶US Army flight tests have shown that the UH-60 aircraft may be recovered with the I-UMARK. In this configuration, the aircraft is lifted by the rotor hub, with slings around each of the rotor head hub arms. The helicopter is flown, only in emergency situations, with the main rotor blades attached and tied down during the aerial recovery.

²⁷The position of the collective flight control and stabilizer may be left "as is" and need not be set in any special position for the I-UMARK or UMARK aerial recovery.

²⁸Post-recovery inspection criteria have not yet been developed. Therefore, the inspection criteria for blade strike and hard landing cited in the aviation unit and intermediate aircraft maintenance instructions; TM 55-1520-240-23, TM 55-1520-236-23, TM 55-1520-220-23, TM 55-1520-210-23, TM 1-1520-250-23, TM 1-1520-252-23, TM 55-1520-228-23, TM 55-1520-234-23, TM 1-1520-237-23, TM 1-1520-238-23, TM 55-1520-248-23 series for the OH-58A/C, AH-1, UH-60/EH-60, AH-64A/AH-64 Longbow, CH-47/MH-47, UH-1/EH-1 aircraft should be used to ascertain further airworthiness. A specific aircraft inspection may be required after using the rotor head suspension method. Check applicable maintenance manual, special inspection section. If any doubt exists, the rotor component should be replaced.

²⁹US Army flight tests have shown that the AH-64 aircraft may be recovered with the I-MARK. In this configuration (alternate), the aircraft is lifted by the rotor head mast nut with redundant slings. The helicopter is flown with the main rotor blades attached and tied down during the aerial recovery.

³⁰It is impossible to attach the AH-64 air vehicle recovery sling to the rotor hub with the air data sensor (ADS) in place. Removal of the ADS, if time permits, requires about 20 minutes. If time does not permit removal of the ADS, attachment of the air vehicle recovery sling will require physical bending of the ADS to install the air vehicle recovery sling to recover the AH-64 helicopter. In addition, the removal of the fire control radar (FCR) is required on the AH-64 Longbow. If the Extended Range Fuel System (ERFS) is installed, removal is required (if possible) because of the possibility of unusual flight characteristics.

³¹Exceeding the flight limits may severely damage the main rotor head and/or main rotor blades of the recovered aircraft and requires replacement of these components. Report the amount and duration of flight limits that were exceeded to the unit that owns the recovered aircraft.

³²Height of the load above the ground may be difficult to determine during low level ARK, I-UMARK, and UMARK operations because of the length of the recovery sling system. Pilots should exercise caution during recovery operations to ensure that the load remains clear of obstacles.

³³Except in emergency situations, the main rotor blades are to be removed from all UH- 60/EH-60, AH-64A and Longbow, and OH-58 helicopters before recovery.

³⁴Welded or unauthorized repair parts on the ARK, I-UMARK, UMARK, and HERK components are not acceptable. Only authorized replacement parts are acceptable.

³⁵US Army flight-tests have shown that the AH-1, UH-1, and OH-58A/C aircraft may be recovered with the I-UMARK. In this configuration, the rotor hub mast nut lifts the aircraft, with slings around each barrel of the rotor head. The helicopter is flown with the main rotor blades attached and tied down during the aerial recovery.

³⁶The spacer is not used on the AH-1, UH-1, and OH-58A/C aircraft recovery and should be placed in the I-UMARK shipping container until the aerial recovery is completed and the components are inventoried and secured for future use.

GROUND RECOVERY

5-12. Rigging aircraft for ground recovery is essentially the same as for aerial recovery. The aircraft is prepared for lifting onto the transport vehicle using components (bellybands, slings, etc.) either from the ARK, I-UMARK, UMARK, or HERK recovery kit. The only major difference is that the device used to actually perform the lift is a crane or similar piece of equipment instead of a helicopter. Any disassembly of the aircraft required because of road obstacles or size of the transport vehicle is performed using procedures outlined in the appropriate aircraft technical manual. Any devices (cradles, shipping skids, etc.) required for loading the aircraft onto the transport vehicle are prepared using procedures outlined in the appropriate aircraft shipping manual. The same basic safety procedures—disarming, disconnecting batteries, etc.—adhered to during aerial recovery are observed during ground recovery.

5-13. An aircraft may have severe crash damage. Major portions of the aircraft such as engine, transmission, and rotor system may be torn from the aircraft. If so, rigging procedures may require modification to suit the situation. The ground personnel determine the method used to lift the aircraft. The primary concerns in this situation are to minimize further damage to the aircraft and ensure the safety of the ground crew.

5-14. Nonflyable aircraft may be transported between maintenance facilities or moved because of relocation of the maintenance facility. When they are, the aircraft will be prepared and loaded for ground transport as specified in the applicable shipping manual. The procedures outlined in shipping manuals are designed for use when shipping flyable aircraft over extended distances. The same procedures are effective for moving aircraft that are intact but not flyable because of maintenance. Use of these procedures will minimize the possibility of damage to the aircraft occurring as a result of the movement. Sling loading is an option in this situation; however, the chances of damage occurring to the transported aircraft are much greater than with ground transport. The urgency of the situation and the availability of transportation assets determine the method of movement to be used.